

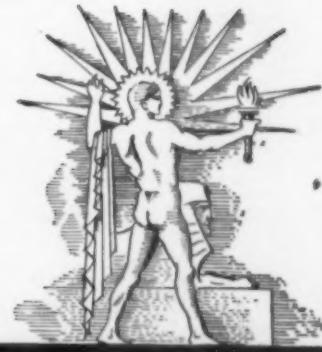
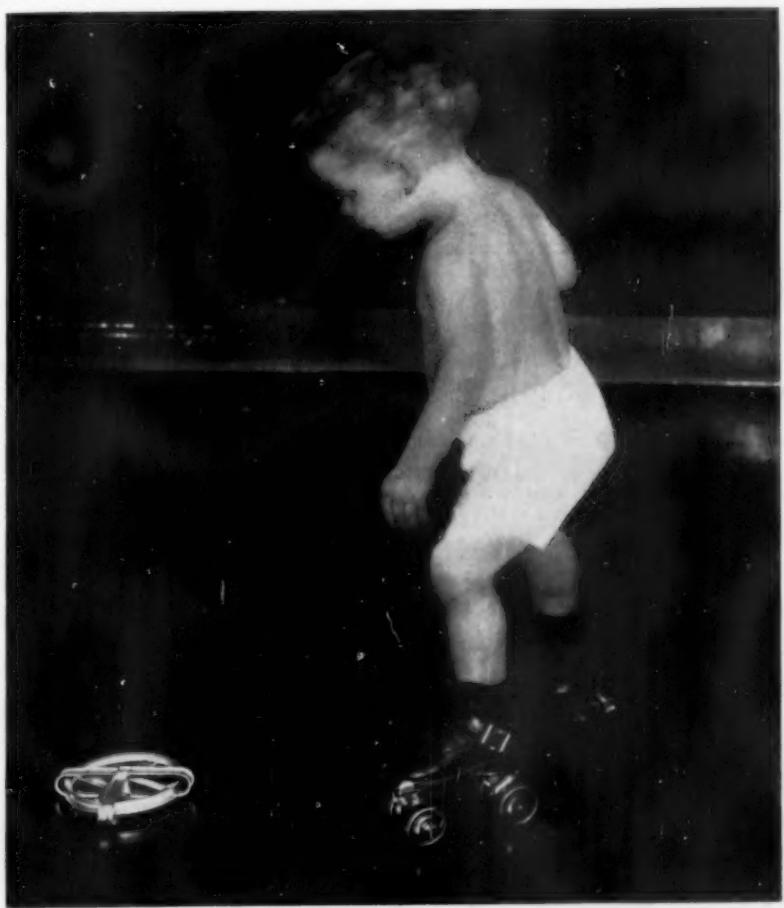
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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



DECEMBER, 9, 1933

Skating at 18 Months

See Page 378

A

SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

VOL. XXIV

No. 661

The Weekly Summary of Current Science

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DO YOU KNOW?

It has been said that quinine did for medicine what gunpowder did for war.

A herd of bison transferred north to Alaska five years ago is now more than doubled in number.

Racing yachts made of aluminum may be an improvement on wooden hulls, a British inventor believes.

A Roman food shop, remarkably complete in its contents and fittings, has been discovered in Herculaneum.

Broken bits of pottery served the Egyptians as "scratch paper" on which to keep accounts, write notes, and give receipts.

The cold cream invented by the Roman physician Galen almost 1,800 years ago is not very different from the modern formula.

Russet oranges are not sweeter than bright ones, according to analyses by government scientists.

Arica, Chile, has the name of being the world's driest town, its average rainfall is a fraction of an inch in a whole year.

The spider known as the black widow has a seriously poisonous bite, but is so timid that she usually tries to retreat when disturbed.

Palestine has its first radium institute since Prof. Ludwig Halberstaedter of Berlin has arrived to take the chair of radiology in the Hebrew University.

Jivaro Indians of the Amazon jungle make musical instruments modeled after the white man's violin, carved out of native wood and fitted with strings of palm fiber.

WITH THE SCIENCES THIS WEEK

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What does encephalitis mean? p. 380.

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What is a "battle line" weather map? p. 371. *The Drama of Weather*—Sir Napier Shaw—Macmillan, 1933, \$3.50.

What is the age of tree rings recently studied by Dr. Douglass? p. 376.

NATURE STUDY

When did pronghorn antelope become fierce fighters? p. 377—*Our Wilderness Neighbors*—Dorr G. Yeager—McClurg, 1931, \$1.25.

PALEONTOLOGY

When did monkey-like animals live in the Dakota Badlands? p. 376. *A History of Land Mammals in the Western Hemisphere*—William B. Scott, Macmillan, 1924, \$6.50.

Where has a ram been kept in cold storage for years? p. 373.

PHYSIOLOGY

What part of the body harbors absorbed radium? p. 384.

PSYCHOLOGY

Can an infant chin the bar? p. 378. *The First Two Years*—Mary M. Shirley—Univ. of Minn., 1931, Vol. 1, \$2.

PUBLIC HEALTH

How may cheap boned chicken be given the appearance of good quality? p. 374. *One Hundred Million Guinea Pigs*—Arthur Kallet and F. J. Schlink—Vanguard, 1933, \$2.

RADIO

How long does it take molecules to relax? p. 372.

RADIO-ASTRONOMY

Why is radio reception so good? p. 373.

VOLCANOLOGY

What is the height of Mauna Loa? p. 377.

These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but are references for further reading. Books cited can be supplied by Book Dept., Science News Letter, at publishers' prices, prepaid in the United States.

METEOROLOGY

Weather Bureau's "New Deal" To Change Forecasting Basis

Weather Maps of Future Will Show "Battle Lines" Where Air Masses From North and South Contend

WEATHER maps issued by the U. S. Weather Bureau will take on some of the appearance of battle maps, if one of the outstanding recommendations of a special committee of the Science Advisory Board is put into effect. The preliminary report of this committee strongly advocates the adoption of the method of weather study known as "air-mass analysis," first developed in Norway, for general use in the United States. This method is not intended to supplant the one now in use, but to supplement it, so that weather maps with the familiar roughly elliptical outlines of "highs" and "lows" will be accompanied by others showing the weather as "battle lines."

The "battle-line" weather map is no mere figure of speech, for the air-mass analysis method of weather forecasting uses as its basic data information gained by the study of great moving mountains of air that migrate down from the poles and up from the tropics, meeting, pushing against each other, and over-riding or under-running like players in opposing football lines. The interplay of forces borne in these air masses gives us rain and snow, wind and fair weather. The air-mass analysis method has been in successful use in Europe for several years.

Airplanes, whose movements are benefited by the new method, are essential to the gathering of data used in it; for the air-mass analysis method must have figures on temperature, pressure and humidity from aloft as well as on the ground. For this reason, among others, the committee recommends also the integration of all the present separated weather-studying and reporting services into one central organization, consolidated under the Weather Bureau, except for the activities necessary to the Army and the Navy. The meteorological work of the Army and the Navy, however, should be closely coordinated with the work of the Weather Bureau, the committee recommends. This would have a double advantage, for Army and

Navy planes can be used for the gathering of weather data aloft in connection with their regular training schedules at little or no added expense, while the wire and radio reporting services, which the committee suggests should be concentrated in the hands of the Weather Bureau, will render fuller and more dependable information.

In addition to these two major recommendations, the com- (*Turn Page*)

ARCHAEOLOGY

Ancient Statuary Revived In Colored Terra Cotta

AN ASSEMBLAGE of Greek gods and heroes, portrayed in life-like colors as they were in the temples of Athens, is a feature of the Pennsylvania Museum of Art. The picture shows the first of the tympanum-panels for the pediments, now in place.

An appreciative study of Philadelphia's revival of an ancient art method in *Art and Archaeology*, says:

"As viewed from afar the statuary

adds a scintillating spot of color to the building, although the brilliant hues are softened somewhat by the distance from the eye-level. The flesh-color becomes cool in tone, giving that godlike quality that was intended to be produced. The deep blue of the background becomes azureous and gives a feeling of transparency and vastness that gives the figures of the gods and goddesses an impression of solidity and dominance."

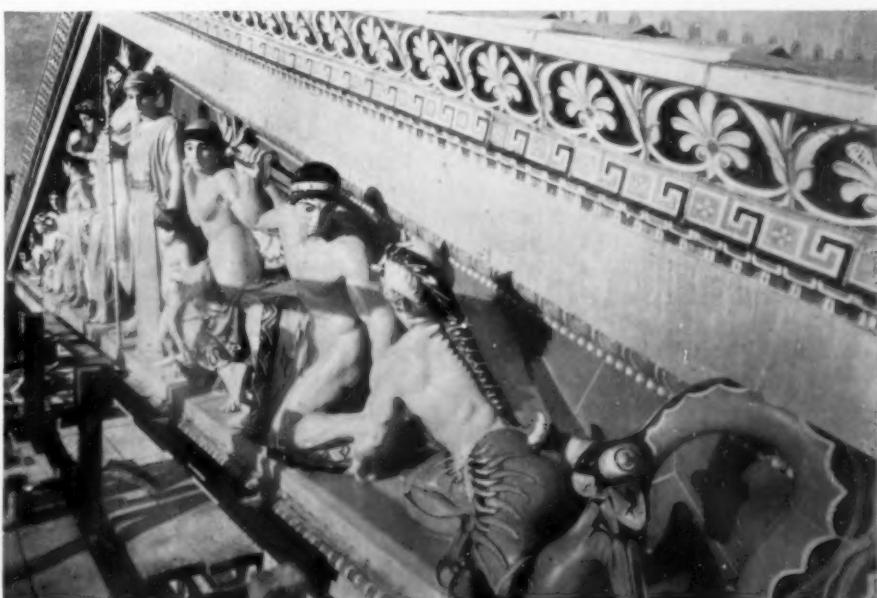
That the Greeks immortalized their gods, not in ghostly white figures but in beautiful color, dawned upon the modern world only a few years ago. Patches of color on faded statues revealed the forgotten fact, and showed that Greek cities must have been brilliantly colorful in their abundance of fine art.

The Pennsylvania Museum represents the first attempt in this country to reproduce the old and colorful art authentically on a large scale, placing it on a building of Greek design, so that the antique manner can be adequately appreciated. The statuary was manufactured by the Atlantic Terra Cotta Co.

The row of Greek notables includes, left to right: Aphrodite standing next to the central figure, Zeus; on his other side Demeter, holding the child Triptolemus by the hand; Ariadne, and Theseus kneeling to slay the Minotaur which crouches half-man, half-beast, before him.

The figure of Zeus is twelve feet tall. The figures are of glazed polychrome terra cotta, as the ancient Greek artists would have made them.

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GREEK GODS IN PHILADELPHIA

Art & Archaeology

mittee also considers the following innovations desirable:

A certain decentralization of the general forecast work of the Weather Bureau by the establishment of more numerous district forecast centers in place of the five now existing.

An extension of climatological work looking toward long-range forecasting.

Efforts toward cooperation with other countries in the Northern Hemisphere, particularly Canada, Mexico and Russia (Siberia) in securing appropriate meteorological data which will disclose the movements of major air-masses over all these areas, in the interest of increasing the time range of weather forecasting.

"Postgraduate" training for Weather Bureau meteorologists, which will give their scientists the benefits of the best university and research institution training, keeping them constantly up to date in their information and methods.

Establishment of a permanent Weather Bureau Committee, composed of four

or five of the outstanding scientists of the country, to advise on matters of weather service and policy.

The committee, which has spent several months of intensive study and conference on Weather Bureau problems, consists of Dr. Isaiah Bowman, chairman of the National Research Council and director of the American Geographical Society; President Karl T. Compton of Massachusetts Institute of Technology; Charles D. Reed, observer at the U. S. Weather Bureau Station, Des Moines, Iowa; and, as chairman, Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics, California Institute of Technology.

The committee was appointed by the Science Advisory Board, which is a functional organ of the National Academy of Sciences and the National Research Council. The Board and its committees also have in hand other science problems of the national government, on which reports will be made later.

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ARCHAEOLOGY

Masterpiece of Da Vinci Lost Four Centuries Reported Found

UNRECOGNIZED for four centuries, one of the long-sought masterpieces painted by Leonardo da Vinci has been found and identified, it is announced by Prof. J. D. Paulson of North Carolina State College.

From Leonardo da Vinci's long art career only two paintings have survived that critics universally agree are the work of his brush. To these two, the *Mona Lisa* and *The Last Supper*, must be added an important third, if Prof. Paulson's identification is accepted. The picture is the *Birth of Christ*. It was once among the Russian royal art treasures in the Hermitage of Petrograd. It is known as a painting by Botticelli and goes under the title *The Adoration of the Kings*.

Prof. Paulson, who has made a special study of obscure inscriptions on famous paintings, especially those possibly by da Vinci, finds a number of such identifying marks on the painting. Faint as they are, Prof. Paulson declares that they are visible to any average eye. Photographic processes using the proper color filters and panchromatic plates bring out the writing further.

These inscriptions are names and

monograms marked on the painting to identify certain persons depicted on it. Among the group of kings and attendants kneeling before the Christ Child, the artist worked in the faces of a number of personages of his day, Prof. Paulson explains. These included the Emperor Maximilian, for whom the picture was painted, the French King Charles the Eighth, who was in Milan planning the invasion of Italy, the Duke of Milan, who died the year after the picture was finished, and a full-length portrait of Leonardo himself showing how the great artist and scientific genius looked in his prime. The Leonardo portrait is said to be marked with his monogram and the date 1493. Prof. Paulson reports also finding Leonardo's device LDAV on the painting.

As corroborating evidence that the painting is by Leonardo, Prof. Paulson says that "it is mathematically balanced, based upon a perfected geometric skeletal structure, contains some passages of supreme delicacy, and includes portraits of an assemblage of persons which occurred only in Milan at the time when Leonardo da Vinci was working there."

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RADIO

Inch-Long Radio Waves Interest Marconi

WHEN Guglielmo Marconi, the father of radio, visited the California Institute of Technology a few weeks ago he was most vitally interested in the experiments of Prof. G. W. Potapenko, who has developed a short wave generator.

Senator Marconi has been using 50 centimeter waves and was delighted to learn from Prof. Potapenko how to generate shorter ones down to 3 centimeters, only slightly longer than an inch. Prof. Potapenko's method has an additional advantage in providing very steady oscillations—an important feature not obtainable by older methods, but necessary for precise measurements.

The reason Senator Marconi wants short waves is that they can be concentrated in a beam like a searchlight beam. This saves energy and makes secrecy possible in wireless communication. To make a reflector for electromagnetic waves such as radio waves or light waves, one needs a mirror larger than the wavelength. This is easy for light but is inconvenient for any but the very short radio waves.

Prof. Potapenko is not working on communication problems at the moment but is applying his generator to high frequency magnetic and electric experiments. This field is almost unexplored, in spite of the fact that Dr. R. A. Millikan performed some of his earliest work along this line more than 35 years ago. The problem was to find out how the electromagnetic waves are absorbed by the molecules of various substances. Prof. Potapenko has only recently settled the matter and found that the molecules are rotated by the waves and relax gradually to their original position. The energy of the rotation is taken from the waves. When the frequency of waves is above a billion a second much energy is absorbed. This shows that the molecules take less than a billionth of a second for their relaxation time. The bigger molecules are more sluggish than the smaller.

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Although the first of the sunspots of a new cycle appeared last month, Mt. Wilson Observatory observations on Friday, Nov. 24, showed that there are spots of the old cycle still appearing on the sun's face. A group of two spots was found.



REFRIGERATED FOR YEARS

PALEONTOLOGY

Moving Glacier Uncovers Ram Preserved In Ice

CHAMPIONSHIP cold-storage mutant honors may be claimed for the body of a mountain sheep, entombed for years, probably for centuries, in a glacier in Yosemite National Park. It was recently found in an almost perfect state of preservation.

When found, the ram was lying against a pillar of ice built up by his own shadow, and about thirty feet from the snout of the glacier which apparently had been his mausoleum. It is thought he was approximately one-half mile from the spot from which he probably fell to his death.

Park Naturalist Bert Harwell, who with Ranger Ed Beatty discovered the ram, conducted Dr. Erich Wasmund, a lake geologist from the University of Kiel, Germany, to the find. Dr. Wasmund, who has made a special study of the decomposition of animals remaining long periods of time under water and ice, agrees that Harwell's theory is plausible.

The ram, feeding on the crest of Mount Lyell, fell into the bergschrund or crevasse near the head of the glacier. He was deeply buried and has traveled a few feet a year with the glacier movement, gradually melting out to the surface. He could not have been exposed many summers; for the ever-present coyotes would surely have found him. Mr. Harwell adds that this has been a summer of excessive melting.

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RADIO-ASTRONOMY

Increasing Spottiness of Sun To Help Local Radio Reception

Turning of 11-Year Cycle, Affecting Radio Near End Of Next Year, Will Also Weaken Signals of Distant Stations

By DR. HARLAN T. STETSON,
Director of the Perkins Observatory at
Ohio Wesleyan University.

THE RECENT announcement of a few high latitude sunspots carries special significance for the radio fan, for it announces that we have definitely marked the minimum in the present sunspot cycle. Observations at the Perkins Observatory have shown that field intensities from the Chicago station WBBM during the last two years have remained consistently at the highest level since the sunspot maximum in 1928-29. The present field intensities average about 2000 microvolts in the observatory's antenna, a value fifty times greater than that measured at the beginning of the decline in sunspot numbers.

The few spots that have been occasionally appearing during the present sunspot minimum have shown a comparatively small effect on the radio as compared with the effect produced by the terrific solar cyclones which raged on the sun four and five years ago. Long distance reception in the broadcast band has never been better than in 1932 and 1933 since the advent of broadcasting. Contrary to popular belief, however, this has not all been due to improvements in radio technique nor the increased power in broadcasting stations. The fifty-fold increase in intensity can without doubt be attributed to quieting activity in the solar disturbances which are chiefly responsible for the ionization of the Kennelly-Heaviside layer.

The rise in the ionized layer during the last two years which has been responsible for the excellent long distance reception has, however, had a somewhat disquieting effect on those who listen to programs thirty or forty miles from a broadcasting station, for the sky wave has come through so well as to interfere with the ground wave at these critical distances, thus producing interference and mushiness in receiving sets within this critical area. With the beginning of the new sunspot cycle long

distance reception during the next few years will deteriorate, but the disturbing factors just mentioned in local areas should become less troublesome. Radio fans therefore may expect to be compensated for their lack of DX reception by much improvement in the shorter range.

A careful analysis of recent behavior of sunspots as studied at the Perkins Observatory reveals that no material change from the present radio conditions will be apparent until near the end of 1934. Conditions for transcontinental enjoyment of programs should therefore continue for another year. In addition to the measurement of the daily reception of WBBM Chicago at Delaware, the Observatory has recently inaugurated nightly measurements of KFI San Francisco which should materially contribute to further knowledge of the behavior of the ionized layer with the coming rise in the sunspot cycle.

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ARCHAEOLOGY

Prehistoric Ruins to Be Restored By Works Program

FIRST AID for two important prehistoric ruins in the Southwest, which are seriously in danger of disintegrating, is assured under the Public Works Program.

An announcement by Secretary of the Interior Harold L. Ickes states that \$16,500 has been allotted to repair major ruins in Mesa Verde National Park, Colorado, and \$17,175 for repairs to Aztec Ruin in the Aztec Ruins National Monument, New Mexico.

At Mesa Verde, Indian laborers will receive more than half the allotment as wages for repairing the abandoned homes of their forefathers. The rooms they will repair were built and inhabited during the eleventh century and several succeeding centuries, as scientists have determined by study of tree rings in the house beams.

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PUBLIC HEALTH

"Chamber of Horrors" Built by Food and Drug Bill Advocates

Death and Deformity Featured in Gruesome Exhibits As Evidence of Harm Caused by Products Now Sold Legally

EDITOR'S NOTE: This is the second of two articles discussing the New Deal's proposed Pure Food and Drug Law. They are written by Dr. Frank Thone, Science Service staff writer.

GETTING ready for the campaign that will be necessary to bring food and drug legislation up to date in this country, the Food and Drug Administration staff have prepared, in the Department of Agriculture headquarters in Washington, a "chamber of horrors," consisting of deceptively packaged foods, poison-loaded cosmetics and quack remedies, with attested and photographic evidence of their evil effects.

One of these has already become a classic: the "cure" for diabetes made from a common weed, the glowing testimonials of its users balanced by their death certificates. Perhaps the most pathetic of all the testimonials is one written after the victim was already dead: his widow wrote it; and so touching was her faith in the worthless fluid on which her late husband had wasted his money at twelve dollars a bottle, that she offered to recommend it to other diabetics!

By way of comic relief, there is a "female remedy," known and advertised for many years. Its published claims, and the testimonials of its users, still assert its great value in the cure of many specified diseases. But even under the present law it is not permitted to tell lies on the label, so the bottle itself bears this masterpiece of slippery phraseology: "Recommended as a vegetable tonic in conditions for which this preparation is adapted!" That is, it's good for what it is good for.

Before and After

The prime horror in the whole collection, however, is not shown to the general public. It is a pair of photographs; the first of a really beautiful young woman, the second taken some weeks later, after a poisonous eyelash dye had nearly blinded her and had permanently disfigured her whole face.

It is so repellent that even the tough-stomached scientists in the laboratory don't care to look at it a second time.

But a short time ago Mrs. Roosevelt, an ardent crusader in the cause of the bill, visited the exhibit. She was given a glimpse of the two photographs. Immediately she commanded them. And now she is showing that particularly atrocious consequence of the greed of one pirate of business to Cabinet ladies, Senators' wives, business and newspaper women, Junior Leaguers, and any and all who come her way. It may make delicate nerves squirm—but it is surely winning feminine recruits to the support of the Copeland bill.

Amusing "Slick Tricks"

Slick tricks by food packers of dubious ethical standards, which offer unfair competition to the legitimate trade and at the same time cheat the consumer, have been uncovered by the dozen in investigations carried on by the Food and Drug Administration. Some of them are amusing, in spite of the meanness of the small-time greed they betray, so that visitors to the exhibits on display at the Department of Agriculture catch themselves laughing and frowning at the same time.

There is the paper-thin veneer of white meat laid around the wall of a jar of boned chicken, giving the impression of a really high-quality product; but within it is a mere mass of scraps, mostly rather undesirable-looking bits of dark meat and rice. There is the glass of "peanut spread"—peanut butter liberally diluted with starch. There are jars of preserves, demurely labeled "strawberry flavored," but with vivid pictures of big red strawberries displayed to lure the purchaser's attention away from the fact that content is like the famous "fifty-fifty" rabbit sausages—one rabbit, one horse.

The kid who spends his prized nickel on an ice cream cone may be made the victim of a double "gyp;" sub-standard content of butterfat, and too much air

whipped in to bulk up the ice cream. Legitimately made ice cream contains a little less than a third of its volume in air, but ice creams have been purchased on the open market that contained 56 per cent. of this cheapest of all diluting agents.

One slick trick that has been very irritating to the manufacturers of egg noodles was all done with cellophane. A manufacturer of a cheaper, eggless variety of noodles simply wrapped his product in yellow-tinted cellophane, which gave the customer the impression that the white dough-strips within were a rich egg yellow. At the same time the noodles were packed in very loosely, to make the package look big. Most of the complaints against this practice have come from competing manufacturers, who feel that this is decidedly a chiseled's trick.

"Let the Seller Look Out"

All these sharp practices, and a lot more like them, petty as individual cases but bulking into millions in their cheating of the public, are strictly within the letter of the present pure food law. To stop them, the new Copeland bill bolsters up present provisions against misbranding, adulteration and misrepresentation; and it adds a new feature, the authorization of the Secretary of Agriculture to set up standards which must be met by manufacturers and packers.

The framers of the new measure believe they are safeguarding the interests of the legitimate industry as well as of the purchasing public. But for the "slick guy" in the business they aim to substitute for the old legal maxim: "Caveat emptor," "Let the buyer beware," a new one: "Caveat vendor," "Let the seller look out!"

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THE POPULATION PROSPECT

an address by

Dr. O. E. Baker

Senior agricultural economist of the Bureau of Agricultural Economics, U. S. Department of Agriculture

Wednesday, December 13, at 4:35 p. m., Eastern Standard Time, over Stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

One of the most hotly contested points along the whole battle line over the new bill to be presented before the coming Congress will be the matter of advertising. Advertising does not figure in the present food and drug law, because in 1906, when it was enacted, advertising was not such a force in national buying and selling as it is now. The present law merely prohibits untruth in labelling, so that an unscrupulous manufacturer or dealer can tell all the lies he thinks will bring him a profit so long as he does not print any of them on the package.

The new law strikes directly at this weakness, and it takes in plenty of territory while it is at it. An advertisement of food, drug or cosmetic shall be deemed to be false, it states, "if in any particular it is untrue, or by ambiguity or inference creates a misleading impression regarding such food, drug or cosmetic."

It is that latter clause, the ambiguity or inference one, that is raising a particular howl from the ranks of a certain part of the proprietary medicine trade. Manufacturers of products which the present law cannot prove to be fraudulently presented are expert in oblique statements, that create impressions without making straight assertions, and they are rightly afraid of what may happen to them if they are suddenly confronted with the necessity to tell the truth, the whole truth, and nothing but the truth.

Some of their agents have tried to spread their panic to the newspapers and magazines, by the claim that editors can be fined and jailed for printing false or misleading advertising, of whose nature they could of course hardly be expected to be completely informed.

Accuracy in Advertising

The sponsors of the Copeland bill disclaim any intention to hold either newspapers or advertising agencies responsible for the factual content of the advertising they print or prepare for printing and they declare their intention to exclude them specifically from such responsibility. But by the same token, they do intend to "crack down" on the Ananias fringe among food, drug and cosmetic manufacturers, whose irresponsible claims work harm alike to advertising media, legitimate businesses, and the long-suffering consuming public.

One new and important advertising

medium will doubtless show the effects of this new demand for accuracy in advertising to a much greater extent than newspapers and magazines. That is the radio. After all, editors have been in the game long enough to know an advertising Ethiopian in the woodpile when they see one, and most of them want nothing to do with advertising that will defraud or injure their subscribers. But radio is a younger business and apparently either less worldly-wise or less discriminating than newspapering, for the stuff that gets into some radio advertising "spiels" makes newspapermen (and the general public, too) hold their noses. It will be most interesting to watch the revision of radio "plugging" if and when the Copeland bill is enacted into law.

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ASTRONOMY-PHYSICS

Arctic on Short Rations Of Ultraviolet Radiation

RESULTS of the recently concluded Polar Year, in which twenty nations with lands or interests in high latitudes both north and south collaborated in the gathering of geophysical and meteorological data, are beginning to be digested. The major findings will probably be the last to be announced to the public, for they require the longest and most tedious labors over the comptometers and sliderules; but in the meantime some interesting facts and figures on conditions in the regions of the aurorae and the midnight sun are beginning to trickle out.

One determination of very considerable practical importance in the everyday affairs of the probably near future is that the Far North is on permanently short rations of ultraviolet radiation. This has been learned from studies of solar radiation conducted at College-Fairbanks, Alaska, by scientists of the U. S. Naval Research Laboratory, under the leadership of Dr. H. B. Maris. It was learned that there is an adequate amount of this physiologically necessary radiation in the Arctic sunlight only when the sun is high in the heavens, and that occurs only during the noonday hours in midsummer. Summer mornings and afternoons, and the whole days of spring and autumn, are deficient or practically null in their ultraviolet

PHYSIOLOGY

Lack of Vitamin G May Cause Eye Cataracts

CATARACTS and other disturbances of the eyes can be brought about, in rats and mice at least, by a diet lacking in vitamin G, Drs. William C. Langston and Paul L. Day of the University of Arkansas School of Medicine reported to the Southern Medical Association meeting. Feeding vitamin G to the animals retarded the development of the cataract and even prevented its maturing, but did not cure the condition brought about by lack of the vitamin. The Arkansas investigators did not state whether this vitamin has any relation to cataract in man.

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concentration; and of course the long winter night, with the sun either totally gone or at most a feeble glimmer near the southern horizon, is a time of ultraviolet starvation.

When, therefore, we turn our attention to the more thorough exploitation of the natural resources of the Far North, or establish permanent aviation bases or weather observatories there, we must give special consideration to the ultraviolet requirement of the men who will do a right-face on Horace Greeley's advice and "go North." The short-lived gold rushes into the Yukon valley brought their vitamin-deficiency problem in the scourge of scurvy. But most of the gold-seekers soon came out again; they presented no permanent problem such as a long-time occupation of lands of twilight and dark will bring.

The conquest of the North must either be carried on by rotating corps of men who will take turns coming south for sun-soakings, or by equipping them with batteries of ultraviolet sun-lamps, or by making up in their diet for what they lack in direct irradiation. Codliver oil by the quart, as the Norwegian fishermen of the most northerly fjords drink it, may have to become a part of the daily tipple of the men of the "Drang nach Norden."

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AGRICULTURE

CWA Employment Figures Rival War Recruiting Speed

DRAMATIC as the speed with which the armed forces of the United States were increased for the World War from mere thousands up to millions, is the rate with which the Civil Works Administration, under Harry Hopkins, is recruiting its unarmed work-relief army from the ranks of the unemployed. Already the number thus re-employed totals into millions. In three days, between Wednesday, November 22, and Friday, November 24, nearly 60,000 recruits were added, all of them going into action for the U. S. Department of Agriculture.

One heartening thing about the campaigns of this unarmed army is the extent to which science figures, both in their present employment and in the benefits that will be derived from their efforts. The Forest Service takes over half of the agricultural increment, 30,000 men, and the Bureau of Entomology another 22,000. The remainder of the new forces are split among the Bureaus of Plant Industry, Animal Industry, Chemistry and Soils, and the new Soil Erosion Service.

This does not mean that all of the men in this swiftly recruited corps are scientists. The Army of the Re-employed is no huge brain trust. But even the laborers will be working for science—eliminating mosquito swamps, clearing wide areas of cattle tick infestation, warring on tree diseases and insect pests in the National Forests, and a score of other projects long wished for by the scientists and executives of the Department of Agriculture but never possible until the paradox of money made available by hard times made them so.

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METEOROLOGY

Tree Ring Forecasting Of Weather Still Distant

LONG-RANGE weather prediction is still far in the future, if it is possible. So declares Dr. A. E. Douglass, astronomer of the University of Arizona, whose sun and climate studies are attempting to bring the weather man's favorite dream nearer reality.

In a progress report of his researches, in *Scientific Monthly*, Dr. Douglass shows that before good years and bad years can be predicted, there must be

research to show the actual climatic cycles that the earth experiences, and the factors that interrupt the cycles, upsetting the complex rhythms.

Dr. Douglass' studies led most recently to an investigation of very ancient weather history as recorded in annual growth rings in petrified tree stumps. The width of 250,000 annual growth rings, precisely measured, reveals that climate millions of years ago manifested itself in cycles which are like cycles demonstrated in modern tree-rings, and which approximate in length the cycles that astronomers find when they study sunspots.

These cycles in which climate recurs are complex. No less than three or four cycles of varying lengths are found mixed in the sunspot and weather histories. There are puzzling breaks in the cycles which are not yet explained.

Complex as they are, however, the climatic cycles are real cycles, distinguishable from accidents if shown in long sequences, the astronomer states.

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ASTRONOMY

Five Billion Years Set as Minimum Age of Universe

IN DISCUSSING the significance of the paper on the expanding universe, presented to the National Academy of Sciences by the Abbé Georges Lemaître, Dr. Harlow Shapley, director of Harvard College Observatory, mentioned that some recent observations of his own had materially reduced the current estimate of the rate at which the cosmos is "exploding" and as a consequence its estimated age as well. The universe, at least that part of it we now know, does not need to be less than five billion years old, he said.

A still more dizzying figure was one which he gave as a very rough and tentative estimate of the density of matter in the greatest "super-galaxies"—vast aggregations of spiral nebulae, each individual nebula containing billions of stars as big as our sun or bigger. Despite this tremendous massing of matter, Dr. Shapley's estimate of its average for all the space occupied by such a super-galaxy in grams per cubic centimeter is represented by a fraction written as 2 over a 1 followed by 28 zeros. And this, he said, is very much thicker distribution of matter than that which exists in the space between the super-galaxies. (See *SNL*, this issue, p. 382)

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IN SCIENCE

ASTRONOMY

Model Will Show How Earth Looks To Moon

VISITORS to the new museum of The Franklin Institute, Philadelphia, will soon be able to see how our earth appears to the "man in the moon." In a corridor to the side of the Fels Planetarium, there is being placed an 18-inch globe by Howard Russell Butler, of Princeton, N. J. Mr. Butler was aided by astronomers at Princeton University in painting the globe to show the appearance of the earth from out in space. From such a viewpoint the familiar continental outlines are not nearly as conspicuous as on the usual school globe, because of the effect of the earth's atmosphere, which gives it a bluish cast. The globe will be hung from a bracket, and turned once a minute by a small motor to reproduce earth rotation and bring the continents into view. From one end of the corridor the globe will appear the size of the earth as seen from the moon. A brilliant spotlight will shine on it.

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PALEONTOLOGY

Monkey-Like Fossils Found in South Dakota

LITTLE animals somewhat like monkeys but very much more primitive lived in what are now the Badlands of South Dakota 35,000,000 years ago or some such matter. Broken fragments of the skull and jaws of such a creature, found last summer by geologists of the Scott Fund Expedition of Princeton University, have just had their identity established at Princeton, N. J., by Prof. Glenn L. Jepsen.

The animals belonged to the primate sub-family *Plasiadapidae*, and lived during Oligocene time, which is well back toward the beginning of the Age of Mammals. The fossils are the first of their kind and age to be found in North America, and the skull is stated to be the most perfect representative of its zoological group yet discovered.

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FREE FIELDS

CHEMISTRY

"Safe" Dry Cleaners Sometimes Dangerous

EXPLORATIONS of "safe" dry cleaning fluids have added another hazard to home dry cleaning efforts. Some of the so-called safe solvents sold for home use have been found to be decidedly unsafe. Fluids demonstrated to have been perfectly safe when first used have exploded after being used a few times.

This contradictory behavior has been simply explained by the results of laboratory experiments. These dry cleaning fluids are made up of regular cleaners' naphtha to which has been added enough of an inert solvent, carbon tetrachloride, to make them non-flammable. One-half carbon tetrachloride and one-half naphtha make a suitable mixture.

While in use the carbon tetrachloride evaporates more rapidly than the naphtha, thus leaving a mixture rich in naphtha and hence explosive. Experiments show, for example, that when 37 per cent. of a total mixture originally composed of 43 per cent. carbon tetrachloride and 57 per cent. naphtha had evaporated there remained a mixture made up of 29 per cent. carbon tetrachloride and 71 per cent. naphtha—a decidedly unsafe product.

Fluids made up entirely of carbon tetrachloride or other non-flammable solvents remain safe indefinitely.

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ASTRONOMY

Sun Is Believed Not Likely to Explode

FEAR of some astronomers in the past that the sun might some day become a "new star" and flare up in a sudden explosion, with disastrous effects to life on the earth, are unfounded, according to Dr. Dean B. McLaughlin, of the University of Michigan Observatory, Ann Arbor. His study of nova Ophiuchi, a star which a few months ago was seen to flare up in such a manner, the second time in 35 years, leads him to believe that a nova is real-

ly a peculiar type of variable star, and that the same star may show this behavior time after time.

Previously it was supposed that any star in the heavens might become a nova. As astronomical records showed that there are at least 10 to 12 such new stars observed every year, this gave rise to the view that it was only a matter of time before the sun would become one. Dr. McLaughlin thinks that as accurate astronomical records are kept over a longer period of time, it may be found that many of the novae of the past will flare up again, and if this is the case, our sun may not be of the type that can become one.

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NATURE STUDY

Ranger Couple Witness End of Antelope Duel

PRONGHORN antelope, the most fleet and graceful of American game animals, impress most observers as gentle and inoffensive animals. But in the excited rivalry of the mating season they are capable of mortal enmity and most ruthless cruelty to each other, as Mr. and Mrs. Everett L. Arnold, of the ranger staff, recently witnessed. What the Yellowstone ranger and his wife first saw was a fine buck antelope butting and shoving with all his might at something half hidden by the high grass and sagebrush.

As their car was stopped the "something," a second buck, leaped to his feet and ran out of view behind a small hill. In a minute or so both animals reappeared, dashing directly toward the car, sides heaving and wind coming in great gusts, the foremost one smeared with blood. The pursued animal dropped behind a fallen tree, neck stretched and ears flattened to his head, endeavoring to hide from his enemy who almost immediately pounced on him.

The victor buried the full length of his pronged horns in the soft underparts of his foe, twisting, turning and pushing with all his strength. This took place only a few paces from the main highway and by this time the ranger had reached the scene, shouting and flailing his arms at the murderous buck. After one or two more horrible gouges the victorious pronghorn turned and bounced away. The conquered one was completely disemboweled and death came soon thereafter.

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VOLCANOLOGY

Mauna Loa, Great Volcano, Begins Predicted Eruption

BY DR. T. A. JAGGAR, Volcanologist, U. S. Geological Survey

MAUNA LOA, Hawaii's loftiest active volcano, broke into eruption at its summit crater at 5:43 A. M., Hawaiian time (11:13 A. M., Eastern Standard Time) on Saturday, Dec. 2. Apparently there are three lava fountains, under three towering fume columns. The fumes rise 4,000 feet above the mountain, which itself has an altitude of 14,000 feet. The northern fume column hangs over the center of the crater.

I have undertaken an expedition to the summit, with a party from Hawaii National Park. The Interisland Airways dispatched a plane for aerial observation of the eruption.

There was an earthquake disturbance for an hour following the beginning of the outbreak, but afterwards the ground quieted.

A watch is being kept on the flanks of the mountain for possible lava flows, but as yet we have no means of telling whether these will occur.

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BIOLOGY

Short Rations Prolong Life, But Reduce Birth Rate

SHORT rations enable animals to live longer, but cut their birth rate materially. This conclusion has been reached by Lester Ingle of Brown University as the result of experiments on two species of cladocerans, small water animals related to shrimp and crayfish.

Mr. Ingle reports his work in *Science*, noting that his results are in general agreement with those of Dr. C. M. McCay of Cornell University, who worked with rats, which are about as far removed from cladocerans as it is possible for animals to be.

Mr. Ingle kept females of his animals separately in bottles. In one lot of bottles he put the normal culture fluid in which cladocerans thrive. In the other, he put culture fluid diluted from 24 to 36 times with pond water, thus giving them much less to feed on. The animals on short rations lived nearly 12 per cent. longer than did their well-fed sisters, but produced far fewer offspring.

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PSYCHOLOGY

Baby Skates

Though Johnny is Carefully Trained From Infancy, There Are Some Things He Learns No Faster Than Twin Jimmy

By MARJORIE VAN DE WATER

PSYCHOLOGISTS were amazed by a motion picture film given a private showing for them recently in Chicago. The film showed a little baby less than a year and one-half old doing the most surprising feats of muscular skill. He roller-skated like a miniature master of the art. He climbed off stools of much greater height than his own. He walked up steep inclines with perfect aplomb. And he swam under water without support or with slight support he swam on the surface like a budding Weissmuller.

But the picture did not originate in Hollywood, and this baby is not being exploited for his amazing abilities. He is one of the subjects in a psychological experiment being conducted at the Normal Child Development Clinic at Babies Hospital, New York City. There it was that the film was made.

The experiment is for the purpose of finding out what are the effects of intensive training on the development of the very young child. This little boy has been carefully and intensively trained and exercised from the time he was but 20 days old. His twin brother, for purposes of comparison, has been brought up in the ordinary routine of the modern infant—no systematic exercise, no unnecessary handling, mainly just peace and quiet in his crib.

Twin A and Twin B

The surname of neither twin is revealed by the psychologist who is making the experiment, Dr. Myrtle B. McGraw. She does not wish them annoyed by those who might wish to exploit them. In her scientific report of the research before the American Psychological Association, she referred to them merely as Twin A and Twin B. But they are well known around the hospital as "Johnny" and "Jimmy."

Johnny, originally the smaller and weaker of the two, was the one who received the training. On five days a week both twins were brought to the Clinic at nine o'clock in the morning.

See Front Cover

Jimmy was placed in a cozy little crib in a quiet spot behind a screen in the nursery. There he was left, except for feeding, bathing, and other necessary attentions. Johnny, on the other hand, was immediately put in training.

At two hour intervals he was encouraged to reach and roll. He was turned over on his tummy and allowed to try to crawl. He was held up so that his toes could just touch some hard surface and thus tempted to make little stepping movements.

The purpose of this exercise and encouragement to physical activity was to see whether an infant thus "pushed" would develop physical skills earlier than one left passively to await his own urge to action.

The other twin, Jimmy, was each week put into the same situations and allowed to show what he could do without the training.

"Chinning" Exercise

Another purpose of the experiment was to see whether the physical training would cause an infant to forget sooner the primitive reflexes with which each baby comes into the world.

The new baby is equipped with two queer mechanisms that seem to be handed down from his ape-like ancestors, and that in human development have lost their essential usefulness. One of these is the grasping reflex. If you place a small bar in the hands of a very young infant, he will involuntarily grasp it so hard that he can support his own weight unaided for quite a while before he will drop. Jimmy was stronger than Johnny in this ability to grasp; he would hang on for an unusually long time.

After a few weeks, the ordinary infant loses this grasping reflex, and the adult does not show it at all unless his brain or nervous system is diseased. If you should attempt to hold your weight in this manner, you would find that it requires a considerable effort of the will to continue holding the bar; it is no involuntary reflex with you.

The early training of Johnny in this

"chinning" exercise had no effect on either preserving the reflex or causing it to disappear at an earlier date, it was found. Apparently nature takes its own course in this regard, as in many others.

The other reflex in which Johnny received practice or training was that movement that babies make so automatically when they feel that they may fall. If a baby is lying on a bed and you jostle the bed suddenly, you will probably see him throw his arms up in a circular movement as though he were trying to embrace something.

Nature Not Speeded Up

The movement is reminiscent of the movement of the frightened little baby monkey who clings tightly to the mother lest he fall from his nursery in the tree-tops.

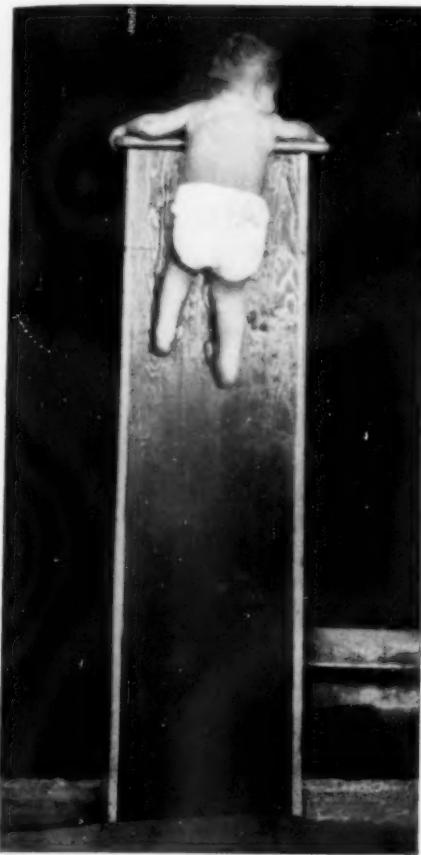
Here again training had no effect. The thing just persisted for a while and then vanished, just as it would in any baby—just as it did in the untrained twin, Jimmy.

And there were many other matters about which Mother Nature took her own good time, and all the training in the world seems to give not the slightest advantage.

When Johnny was ready to sit up erect, he sat. And so did Jimmy. They reached this stage at practically the same age. So all your best efforts in "teaching" a baby to sit up will not do him a bit of good. Neither will propping him up with pillows. You will just have to wait until he is old enough, and then you can't keep him from sitting up.

Reaching for toys, crawling, and standing up alone, seem also to be a matter of development rather than either of training or exercise. The twins paralleled each other in extraordinarily close fashion in the development of these abilities. But as soon as the baby became consciously active in the exercise, the differences in them became not only apparent, but startling.

Climbing is one of the activities of infants that do improve through training. Johnny's training in climbing began with a slide of smooth varnished wood inclined at an angle of 11 degrees, or the very gradual slope you would get by putting one end of a six-foot board up on a block just one and a quarter feet high.



COMING DOWN

This is the way Johnny quickly and easily climbs down a stool sixty-three and a quarter inches high.

Both Johnny and Jimmy, when they first were allowed to play on this slide, showed a desire to go up it and both could make some headway.

Then they were given steeper and steeper slides until little Johnny, not yet a year old, was dauntlessly going up and down on a smooth slide tipped at the thrilling angle of 61 degrees. It was as though that six-foot board had been placed on a block five feet high, making an incline as nearly straight up as anything less sure-footed than a cat could hope to navigate.

Jimmy, who had no training and saw the slides only at the time of his weekly tests, made no attempt to scale the heights. In fact, after the first few trials, he even refused to attempt the very lowest slide.

Ladders and high stools were not introduced to the babies until they were 12 months old.

It took Johnny only two days to learn to toil up the ladder, which towered way above his head. And in but 12 "lessons" he was coming down un-

aided—with some difficulty, to be sure, but at least with great courage and considerable skill.

Jimmy looked at the ladder, and immediately found his interest was in something else.

The stools were graded in height. Johnny soon learned to turn over so that knees or stomach were down on the stool and then let himself slide off to the floor. The gradually increasing height of the stools failed to discourage or alarm him. When he found that even when he stretched his very longest, his toes were still not touching the floor, he would kick his foot against the side of the stool and then let himself drop.

Two Ways of Doing It

In three months, he was coming down without the slightest hesitation from the top of a stool $6\frac{1}{4}$ inches tall, as high as his teacher's head.

Yet when Jimmy wants to get off a stool, be it high or low, what he does is to put on his cutest smile and hold out his arms for help. Some people find that that scheme works quite well, too. Jimmy's smile is very winning.

But the feat that leaves spectators gasping with surprise is the sight of Johnny on roller skates. At the time that he was learning to walk, when he was still not yet one year old, tiny roller skates were obtained for him and strapped onto his little pink feet. They delighted him.

Of course there was many a hard bump while he was learning to glide about on them. The learning was made more difficult by the fact that at first he felt that he must walk on them, trying to lift his feet in a stepping movement. But bumps did not deter him, he would just get up and try again.

Within three months, he was scooting around on skates like a veteran—keeping excellent poise, coasting down grade, and steering himself around corners. Jimmy has never tried this stunt.

Both babies have had their turns in the water, however, and Johnny has learned to swim beautifully, so that he goes unaided across a regular adult's swimming pool, swimming under water.

The practice began when he was only $7\frac{1}{2}$ months old, the time when most babies are just becoming expert at sitting alone in their cribs.

To keep the babies from harm, a special type of swimming apparatus was constructed. A broad strap was placed around the baby's chest just under his

arms, and this strap was attached to ball-bearing rollers and hung from a rod above the pool. In the strap the child couldn't possibly sink, but as his swimming motions carried him through the water, the support would move along easily with him.

Within a month Johnny was holding his own head above water and making real swimming movements. And he was liking the sport. Yet he was not nine months old!

At that time Jimmy's behavior in the water consisted mainly in trying to wipe the water off his face. He would also struggle and roll over. He did nothing that could be considered a real attempt to swim. Evidently the theory that if you just dump an infant overboard he will naturally make swimming movements is completely demolished by this experiment.

Jimmy was 14 months old before he could do as well as Johnny did at 8 months. By that time Jimmy was making rather effective swimming movements with his legs, but he had not yet caught on to the use of the arms or how to keep his head above water.

Johnny is now able to discard the mechanical aid and swims freely under water in a large adult swimming pool. He is also learning to dive.

At first his teacher would hold his feet on the edge of the pool just above the water line. Little Johnny standing straight on his support, would then bend until his head would go into the water in a nice dive. Gradually he got a little spring into it and at the advanced age of 16 months he was doing a voluntary dive, frequently flat but nevertheless creditable.

Cannot Tricycle

Surprisingly, there is one accomplishment that Johnny has not been able to master. Indeed, after four months of practice and 53 lessons, not the least bit of improvement can be noticed by his teacher.

This feat, so impossible for Johnny, is none other than the childish art of tricycling. Johnny, up to date, simply cannot tricycle. Neither can Jimmy.

Riding a tricycle is not nearly so difficult, from a purely physical standpoint, as is roller-skating. It doesn't require anything like the complex movement and coordination of movements that swimming does. Why, then, was it so hard for Johnny?

It must be that the mental process involved in the voluntary pushing of the feet one at a time, and one after

the other, in pedaling the tricycle is of a higher order than that required for skill in the other sports.

If you have ever noticed a young child with a new tricycle, you may have observed that he is inclined to use the new vehicle as a kiddie car and propel it by "walking" it with feet on the ground. Not until the child reaches a certain stage in mental development will he be capable of pedaling.

This discovery was more interesting to the psychologist than the more striking discovery that Johnny could make such unexpected progress in other ways. For it points to a fact of great interest to educators. Apparently, each kind of motor skill may have a corresponding mental age, or stage of mental development, at which it can be learned. Until that age is reached teaching is useless and only serves to waste the time of pupil and teacher and provide annoyance for both.

Perhaps, there may be another age beyond which learning becomes less easy. Perhaps there is one best age at which to learn tennis. Another when baseball should be taken up. Another when writing should be studied. Another for knitting, or billiards, or marbles, or typewriting, and so on.

The present research on Johnny and Jimmy cannot provide the answers to these questions. It does point the way to further study.

Personalities Different

But another result has developed from Dr. McGraw's experiment which she considers more important than the amazing differences in the motor achievements of the twin babies. That is the difference in personality which has been developed by training.

Jimmy obviously has adequate motor and mental equipment for doing many of the performances of which Johnny is capable. What he lacks is the confidence that comes from meeting obstacles and mastering them.

Jimmy looks at the steep slant of the slide, hesitates, and turns away.

Johnny walks right up.

"He has such confidence in himself and the world that after a few trials he will attempt anything he is directed to do," Dr. McGraw said. What a valuable attitude to have in these days of depressions and discouragements!

The most important result of the training of infants is the development of correct attitudes toward life and its difficulties, Dr. McGraw concludes.

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MEDICINE

Sleeping Sickness Seen As Influenza of Brain and Nerves

New Theory Holds That Filterable Virus Attacks Brain And Nervous System Instead of Nose, Throat and Lungs

ENCEPHALITIS, sometimes known as "sleeping sickness" and recently epidemic in St. Louis, may actually be virus influenza of the brain and nervous system.

This new theory of the baffling disease is suggested by Drs. Earl B. McKinley and Elizabeth Verder of George Washington University School of Medicine, in a report to the Society for Experimental Biology and Medicine.

The suggestion that encephalitis is brain "flu" of virus origin is purely theoretical, Dr. McKinley emphasized. So far, there is no proof for it, although there seems to be considerable circumstantial evidence. The theory developed as the result of ten years' investigation and study of the disease.

The name encephalitis simply means inflammation of the brain, Dr. McKinley pointed out. So far, no one has discovered what causes the inflammation. His own research has shown definitely that it is not caused by bacteria or disease "germs." Both Dr. McKinley and other scientists believe that it is caused by a filterable virus, such as causes smallpox and measles. A filterable virus has recently been found to be the causative agent of colds and influenza.

Dr. McKinley suggests that the same virus is the cause of both "flu" and encephalitis. The difference in the diseases is due to the fact that the virus attacks different parts of the body. In virus influenza, the nose, throat and lungs are attacked. A variety of influenza, known as gastrointestinal "flu," has been observed recently, in which the virus apparently attacks the stomach and other digestive organs, causing stomach and digestive upset with or without the other symptoms of influenza. When this same virus attacks the brain and nervous system, encephalitis or brain "flu" results, in Dr. McKinley's opinion.

Encephalitis first appeared after the influenza outbreak during the World War. It frequently follows an attack of influenza. In the St. Louis epidemic the patients suffered digestive upsets at the beginning of the encephalitis attack.

These facts all support the new theory.

Doctors have long suspected a relation between influenza and encephalitis, but it was impossible to explain this relation so long as a bacillus instead of a virus was considered the cause of "flu." Now that both diseases are known to be caused by a virus, a relation between them may again be considered.

Viruses are very susceptible to change in their passage through an individual's body, Dr. McKinley pointed out.

You know how, when you "catch a cold" from a neighbor or relative, you may have an entirely different sort of cold from his. This is because the virus changed in passing through his body and was different when it reached yours.

Just as there are different kinds of colds, there are different kinds of encephalitis attacks. The disease in St. Louis was quite different in some respects from what it had been in previous epidemics in this country. This probably was because the virus had changed somewhat. A more radical change may account for its attacking different parts of the body and causing, as a result, either influenza of lungs and other respiratory organs, digestive upsets known as gastrointestinal "flu," or brain and nervous disturbances, known as encephalitis, according to the new theory.

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ASTROPHYSICS

Star Temperatures Now Found From Spectra Photos

THE PHOTOGRAPHS that are made of the stars when a spectroscope is used in conjunction with a telescope show gradations in character as well as in brightness. These gradations have long been known to indicate the temperatures of the star's surface. Only recently, however, has it been learned how to read the actual temperature from these so-called star spectra. The method has been worked out by Prof. H. N. Russell of Princeton University in con-

junction with the Carnegie Institution's Mt. Wilson Observatory.

We must be satisfied with surface temperatures, Prof. Russell explains, because we can look into a star only through a small mass of its atmosphere. If our atmosphere were as opaque as the hot atmosphere of a star we could see only a few feet in it. The opacity is due largely to the abundance of free electrons and ions which are partly separated from each other on account of the high temperatures. The extent of this so-called ionization can be calculated according to the law of mass action which has proved so powerful in studying chemical reactions.

The extent of the ionization also determines the character of the spectrum. Prof. Russell described how certain lines in the spectrum at first became stronger as the temperature increased and then became weaker again. By studying the relative strength of many lines he tells how hot a star is. By this method he expresses in degrees the temperatures of many stars which have previously been classified only as to color.

Using this information, Prof. Russell is able to determine the relative abundance of different elements in the stars. It turns out that hydrogen, for example, is usually a thousand times more abundant than all the metals put together.

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METEOROLOGY

Trees Protected By Lightning Rods

PROTECTION against lightning has been given to a number of fine trees in Maryland, some of them of historic interest, by equipping them with lightning rods. Success with this method over a period of seventeen years is described by Dean J. B. Whitehead of the Johns Hopkins University engineering faculty, in *Science*.

The equipment is quite simple. Seven-strand copper cable is led to the top of the tree, its end unbraided to give a number of free discharge points, and the lower end soldered to the top of an iron pipe driven eleven feet into the ground. Some trees have been given several such rods. Several of the trees thus equipped had been struck by lightning one or more times before the installation of the rods, but since then no protected tree has been struck, though in some cases other trees nearby have suffered.

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CHEMISTRY

Blush of Green Solution Betrays Poisonous Lead

LEAD, a poison against which our food, drugs and cosmetics have to be guarded with ever-increasing vigilance, is now made to betray its presence by the red blush it causes in a greenish solution of one of the aniline dyes, diphenyl-thio-carbazone, called "dithizone" for convenience by the chemists. The new test, which has the double advantage of being both delicate and quick, was described before the meeting of the Association of Agricultural Chemists by H. J. Wichmann, of the Food and Drug Administration, U. S. Department of Agriculture.

Food and drug analysts often have to determine whether or not a shipment of

fruit is carrying more than the tolerated minimum of lead-spray residue. They cannot take more than a few hours for this. Yet hitherto the quickest accurate lead-determining technique demanded several days. To deliver themselves from this dilemma they made their search for a new and quicker method.

The dye "dithizone" has been known for a long time; it was first described in Germany by the famous chemist Emil Fischer. Fischer even noted the red precipitate caused by the addition of lead. But so far as is now known, nobody had previously discovered the beautifully delicate gradations of color, from the solution's original green through blue and purple to cherry red, that occur when a lead solution treated with ammoniated cyanide is added to a solution of the dye containing chloroform. By matching hues with other

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tubes containing a known amount of lead-dithizone, the chemists can now determine in a very short time exactly how much lead an "unknown" sample contains. The error involved in this operation has been determined as within four per cent.

The dithizone reaction is practically specific for lead. If the suspected sample contains tin or thallium, there may be some interference; but these elements can be eliminated in preliminary steps. A modification of the method, using formic acid instead of chloroform, gives promise of yielding equally accurate determinations for mercury, another poison frequently encountered in food and drug work.

Dithizone has hitherto been manufactured only in Germany, and is exceedingly expensive, the cost of the pure product delivered in this country being about \$400 a pound. However, chemists at the University of Maryland have undertaken its manufacture, and have already succeeded in making enough of it for all official needs.

Science News Letter, December 9, 1933

Although more males than females are born in the United States, by the time the age of 75 is reached there are more women survivors than men.

Fragile porcelain has been developed scientifically until spark plugs stand chilling at 120 degrees below zero and then heating at 1800 degrees above.

Archaeologists are uncovering the road around the walls of Pompeii, removing tons of earth that earlier excavators dumped there when they cleared the buildings.

ASTRONOMY

Terrific Packing Job Pictured In Making of Spiral Nebulae

VAST FLOCKS of stars, each aggregation containing enough matter to make at least ten billions of suns such as our own, and perhaps even thirty billions. Such were the bewildering figures used as points of departure in a discussion of the expanding universe by Abbé Georges Lemaître of Louvain University, presented before the meeting of the National Academy of Sciences.

The spiral nebulae, those beautiful whirls of stars that race through space at almost unimaginable distances, are of such orders of magnitude; of the smaller mass if one accepts the data of one American astronomer, Dr. Edwin P. Hubble of Mt. Wilson Observatory, of the larger if one follows another, Dr. Harlow Shapley of Harvard College Observatory.

Abbé Lemaître was developing his theory of the expanding universe, which calls for a concept of matter rushing asunder through space, of such low density that the average is only one atom to a cubic yard, which would mean an energy equivalent to about the temperature of liquid hydrogen—only a few degrees above absolute zero. The velocity of this explosive outrush is not uniform in all regions, but falls off "locally" to a low critical figure, resulting sometimes in a sort of cosmic collapse. In such collapses the widely dis-

persed matter can aggregate into gases, dust, meteorites; these pile themselves into larger masses, the suns—and groups of nebulae are born. (See *SNL*, Nov. 25, 1933, p. 34)

All the spiral nebulae are approximately equal in mass, Abbé Lemaître's calculations indicate. Their spatial size, also, is of the same order of magnitude—about a thousand light-years in diameter. This may strike one as being rather immense, but into that boundary of a thousand light-years is packed all the matter that once occupied a block of space of 80,000 light-years' diameter.

The packing process requires the conversion of a certain amount of the mass into energy—something like six per cent. of the matter had to be thus dissipated. If there had been stars already in existence in the space, the energy output could not be accounted for, said Abbé Lemaître. But since the "packing" started with matter so widely dispersed that the best of our laboratory vacuums seems terrifically crowded with stuff by comparison, inelastic collisions, producing heat, could occur enough to meet the requirements of the theory.

The galaxy to which the earth's mother, the sun, belongs is a somewhat peculiar one, the Abbé's discussion brought out. Theoretically, partial collapses of space are possible as well as total collapses—mere slowings down of parts of the expanding universe. Within these slowed-down regions there can be local collapses, one of which gave birth to our own galaxy.

One consequence of Abbé Lemaître's study is of practical interest to astronomers. They have long been concerned with the problem of dark matter in space. If there is much of it, obviously space is only imperfectly transparent to the light from distant stars and nebulae. But if there is little, space can be regarded as completely transparent, for all practical purposes. Although there are known to be aggregates of dark matter that are quite dense, and hence light-stopping, Abbé Lemaître's figure giving an average distribution of matter of only one atom to a cubic yard leaves space most reassuringly transparent.

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NATURE RAMBLINGS

by Frank Thone

BOTANY



Grapefruit

POPULAR botany has been recruited to the aid of political controversy by that warrior, still vigorous if no longer exactly happy, who some time ago brought popular zoology into the same arena, mixed and packed into the skin of a "boloney." Having heaved his heavy sausage with telling effect, Al Smith has now tried his marksmanship with a grapefruit.

It is as well, perhaps, that the honorary degrees conferred by various universities upon this eminent Democrat have been in law and the letters; for if he had received a degree of Doctor of Science it might now be the embarrassing duty of botanists and horticulturists to point out the fact that in alluding to grapefruit as "half way between a lemon and an orange," Al got his botanical classification as thoroughly mixed as are the zoological contents of bologna.

Grapefruit, they would point out, is not at all half way between lemon and orange, in the classifications of scholars who have paid careful attention to the taxonomy of the genus *Citrus*. Although they are not in complete agreement as to its exact position on the citrus family tree, botanists do concur in placing it quite close to the orange and rather farther from the lemon. Thus, Dr. Walter D. Swingle of the U. S. Department of Agriculture, writing for Bailey's Standard Cyclopedia of Horticulture, lists *Citrus grandis*, which is the grapefruit, between *C. aurantifolia*, the lime, and *C. aurantium*, the Seville orange. An equally well-versed botanist, Prof. Wilfred W. Robbins of the University of California, classifies grapefruit half way between the Seville orange and *C. nobilis*, the species that includes mandarin orange and tangerine.

It is to be particularly noted that no botanist considers grapefruit to be a hybrid between lemon and orange, a widely held popular notion which possibly Dr. Smith holds, though he does not specifically say so. Grapefruit is a "good" species—by which botanists mean a species distinct from its neighbors, and no hybrid. Like all the rest of the genus *Citrus*, it came originally from southeastern Asia—tropical and subtropical China, and the Malayan region. In its present perfection, however, it was developed practically altogether in Florida, whence its cultivation has spread to southern California, Arizona, Texas and other southern and southwestern states.

If Dr. Smith should desire some hybrid citrus fruits for political bombarding purposes, he might be referred to the tangelo, which is a cross between tangerine and grapefruit, or the lime-

quat, a hybrid of lime and kumquat, or the citrange, which had for parents the common orange and the hardy three-leaved orange. All of these interesting fruits originated on American soil by the blending of separate immigrant strains—therein resembling the "typical" American citizen of the present day, of whom an eminent example may be found in Alfred E. Smith himself.

Science News Letter, December 9, 1933

Swedish museums have evolved a system of artificial lighting for exhibit halls, so that pictures and other objects are seen as if in clear daylight.

A German firm has introduced a non-shatter glass for automobiles and goggles, which is said not to interfere with vision nor to lose cohesiveness by accidents.

ASTRONOMY

Electric Eye May Show That Ours is Just Ordinary Galaxy

Photo-Electric Amplifier on 100-Inch Telescope Detects Stars and Nebulae Lost to Photographs in "Sky Shine"

THE PART of the universe in which we live will probably turn out to be "just another galaxy."

Dr. Joel Stebbins, director of the University of Wisconsin's Washburn Observatory, predicted in a recent lecture at the Carnegie Institution of Washington that new photoelectric measurements of the size of nebulae and the effect of dark, obscuring matter in interstellar space will greatly reduce astronomical estimates of the size of the Milky Way galaxy of stars in which our sun is a minor star and the earth a speck of dust.

Our galaxy has heretofore been considered much larger than other such systems which we see as spiral nebulae, but an astronomical "electric eye" perfected by Dr. Albert E. Whitford of the University of Wisconsin and used by Drs. Stebbins and Whitford last summer on the Mt. Wilson 100-inch telescope has furnished evidence that man does not live in an unusually large collection of stars after all.

The existence of an extensive layer of dark, obscuring material near the

central plane of the Milky Way was confirmed last year by Dr. Stebbins. This non-luminous gas or dust fills up large spaces between the stars. It not only obscures but it reddens the light of distant heavenly objects seen through it, just as the sun looks red at sunset because it is seen through a greater amount of air. This means that the stars are actually brighter than they appear and they are therefore closer to us than has previously been estimated, making the galaxy smaller.

The photo-electric amplifier attached to a giant telescope will detect faint stars and nebulae which can not be photographed because they are lost in the "sky shine" or the diffuse light of the earth's own atmosphere.

The known diameter of the famous Andromeda nebula has been more than doubled, Dr. Stebbins reported, and its extension has been traced out to where the luminosity is only one per cent. of the general surface brightness of the sky.

In the experiments with the improved "electric eye" attached to the Carnegie Institution world's largest telescope on Mt. Wilson, Calif., Dr. Stebbins, who

is also a research associate of the Carnegie Institution, extended the usefulness of the new instrument in measuring light and color of faint stars, clusters of stars and nebulae.

Dark stuff in outer space, unseen by human eyes, actually outweighs the luminous material revealed in the form of shining stars, it is considered probable by Dr. Stebbins. Any reasonable assumption as to the nature of the interstellar dust leads, he said, to enormous calculated masses.

Science News Letter, December 9, 1933

PHYSIOLOGY

Radium Poisoning Treatment Promising

FUTURE sufferers from radium poisoning may have hope for recovery by a method now being developed by Robley D. Evans, physicist of the University of California and Dr. R. Ware of the Los Angeles General Hospital.

These investigators are now trying out their new method on the few survivors of the unfortunate luminous dial paint workers of ten or more years ago, and so far the results are promising. Radium workers in mines and in laboratories will always be exposed to this dread form of poisoning.

The method follows the work of Dr. J. C. Aub, Prof. F. B. Flinn and Dr. S. M. Seidlin and depends on the fact that calcium and radium are very similar in chemical properties. The calcium absorbed by the body goes mainly into the bony structure and therefore the radium also accumulates there. Since the bones are comparatively permanent in composition the radium remains in place, giving off radiations which wreak destruction on the blood-producing centers and on surrounding bone structure.

Now an excess of parathyroid gland hormone will disturb the normal calcium metabolism, causing the system to lose an excess of calcium. Consequently it ought to eject radium too. Of course after this depletion of the calcium has gone far enough the diet must be made rich in calcium to build the bones up again.

Essentially the process is a rinsing out of the radium-contaminated calcium and a substitution of fresh pure calcium. It is a drastic treatment.

To date it has speeded up the rate of elimination of radium to three times the normal rate.

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First Glances at New Books

Genetics

NATURE AND NURTURE—Lancelot Hogben—*Norton*, 143 p., \$2.75. The reader who wants to know the difference between what doctors call familial and hereditary diseases, the scientific facts about the influences of heredity and environment and what may be the results of marriage of close relatives, will find these and many other interesting genetic problems ably discussed in this book. However, the subject of genetics is not a simple one, and while Prof. Hogben has simplified and clarified it greatly, the book nevertheless requires careful, thoughtful reading.

Science News Letter, December 9, 1933

Ornithology

TRAVELING WITH THE BIRDS—Rudyard Boulton—*Donohue*, 64 p., 12 pl., \$1.50. This book is unique in many respects. It is apparently aimed at children, for its text consists of mostly short words in large print, but the scientific information presented is worthy of the full consideration of any adult. It not only tells about the birds as we see them during part of the year but of their ways southward in the winter, illustrating range and route with clean-cut little maps. And the superb full-page plates in color, by Walter Alois Weber, will delight readers of any age. An excellent book to give at Christmas.

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Demography

AMERICAN AGRICULTURAL VILLAGES: 1930—Irving Lorge—*Amer. Statistical Assn. (Columbia Univ.)*, 133 p., \$1. An analysis of census data on a number of small American communities, minutely analyzed, intended as basic data for the new program of planned population distribution. This publication constitutes No. 1 of a new monograph series.

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Nutrition

THE NUTRITIVE VALUE OF THE BANANA—Walter H. Eddy—*Teachers College, Columbia Univ.*, 37 p., 25c. A monograph of interest and value to nutritionists and child specialists.

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Engineering

A LIMITED WAY PLAN FOR THE GREATER CHICAGO TRAFFIC AREA—John A. Massen and others—*Chicago City Council*, 103 p., limited ed., price not yet fixed. An elaborately developed plan for handling the terrific traffic of a modern metropolis by means of specially constructed, isolated high-speed traffic ways, complete even to the healthy suggestion that it be paid for out of current taxes instead of by another bond issue tossed into an already waterlogged market. The planning committee is to be congratulated on its sound fiscal sense as well as on its sweeping engineering vision. The report was prepared by the Albert Russell Erskine Bureau for Street Traffic Research in Harvard University, of which Dr. Miller McClintock is director.

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Technology

HENLEY'S TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES—Ed. by Gardner D. Hiscox—*Henley*, Rev. Ed., 809 p., \$4. Among the improvements to this widely used reference text are new processes from the paint and lacquer industry and formulas for chromium painting. The book is essential to the man whose hobby is a home workshop and would be very useful in any household. Some of the information that it gives concerns dyes, inks, waterproofing, perfumes, cement, plating, glass, dentifrices, soaps, glues, adhesives, cosmetics and oils.

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Photography

THE AMERICAN ANNUAL OF PHOTOGRAPHY, 1934—Edited by Frank R. Fraprie—*American Photographic Publ. Co. (Boston)*, 296 p., \$1.50. Excellent halftone reproductions of firstclass photographs, technique of aperture and timing, the alchemy of the darkroom, brief discussion of "sixteen-millimeter sound," lists of honors and prizes for the past year—this photographers' annual is a worthy addition to its predecessors in that it goes a step beyond them.

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